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S-03 ASN Vice- President Symposium: Advances through theory: an exploration of mathematical models in ecology and evolution

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Level 2

Modeling Aedes albopictus response to control methods based on sterilized males release.

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AIMS:

The tiger mosquito, Ae. albopictus, is emerging throughout the world as a public health hazard through the transmission of many human pathogens for which no effective antiviral agent or vaccine are available. Chemical insecticides remain the main tools to control the tiger mosquito populations, but the development of resistances is threatening their effectiveness. In this context, it is necessary to develop alternative control methods, one of which is the Sterile Insect Technique (SIT) consisting in releasing males that have been sterilized using ionizing radiation. Those males reduce the reproductive success of the encountered wild females, hence causing the target population to decline. Another method is the "boosted SIT", a SIT improvement, where sterile males are also vectors of a biocide transmitted to the females through mating. The biocides (e.g. growth regulators affecting larval development) can be then specifically dispersed to the breeding sites by the females. Yet, experimenting those practices across the relevant space and time scales is costly, as well potentially hazardous. In this context, mathematical models can provide useful tools to test and optimize such control strategies. We will present an age-structured population dynamics model of the vector Ae. albopictus, designed to explore the demographic effects of SIT control strategies. The model accounts for the spatiotemporal heterogeneity of environmental and meteorological conditions across La Réunion Island (Indian Ocean, France). The control strategies and their optimization will be analyzed and discussed.